

**UTILITY PATENT APPLICATION**

**of**

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**for**

**“HEAT REACTOR”**

**UNITED STATES LETTERS PATENT**

**File #1062**

## HEAT REACTOR

### RELATED APPLICATION

This application is derived from my Provisional application serial #60/534,509, which was filed on 01/03/04 in the name of the current inventor.

### FIELD OF THE INVENTION

This invention relates in general to new and improved devices used for reducing air pollution but more particularly pertains to a heat reactor, respectively, which when installed onto a pollution source provides elimination and/or complete combustion of harmful emissions generated there from, including compounds such as oxides of nitrogen, hydrocarbons, carbon monoxide, odors and organic and inorganic particulates. The reactor is of very simple construction as it is basically formed from one elongated tube having internal compartments and flow conditioners, it is extremely energy efficient and does not require any moving parts or maintenance.

### BACKGROUND OF THE INVENTION

Reducing air pollution, particularly emissions from heating devices, including harmful fuel odors and particulates, has become a strong environmental objective and is of extreme concern throughout the world. As a result, because of worldwide tightening of pollution emission standards, inventors have and are continuously trying to invent devices and/or methods that will comply with these increasingly stringent standards. However, heretofore such attempts have not been successful as they are much too costly to produce, are very complicated requiring numerous parts and/or are simply inefficient.

Within the known prior art, there have been numerous devices and/or systems presented, but still there remains a great need for improvement pertaining to "heat

reactors” in general especially those used for eliminating pollutants from home and commercial heating applications. The present invention has developed over the years as a result of building and testing numerous Thermal Oxidizer and heater units since 1993. These types of units or systems, when originally considered and tested to destroy automotive and diesel engine exhaust pollution proved to be somewhat effective for their intended use. The general theory in an altered embodiment has since proven to be an excellent source of heating with low pollution emissions when modified, respectively. Thus, the same basic design has proven to be an energy efficient and economical way to eliminate pollutants from home and commercial heating applications. However, such technology has not as yet been incorporated for use within heat reactors, or the like.

Thus, there remains a great need for a device that can always eliminate virtually all compounds such as hydrocarbons, carbon monoxide, odors and organic and inorganic particulates from heating exhausted and still be energy efficient, such as taught by the present invention and significantly reduce oxides of nitrogen (NO<sub>x</sub>).

#### SUMMARY OF THE HEAT REACTOR

It is therefore an object of the present invention to provide a heat reactor that overcomes the drawbacks and disadvantages associated within the known prior art. For example, the present invention has been simplified and accomplishes unusual results heretofore not achieved. The reactor itself is substantially an elongated tube internally partitioned forming a combustion chamber interconnected to multiple compartments, and also includes flow conditioners that control velocity and swirling of the gases.

Another object of the present invention is to provide a heat reactor that requires little or no maintenance, as it is extremely efficient and durable.

Still another object of the present invention is to provide a heat reactor that can be easily manufactured, is extremely cost effective and marketable.

It is a very important object of the present invention to provide a heat reactor that eliminates all, or at least a very large percentage, such as 99.99% of all the fuel used, liquid or gas.

Yet another important object of the present invention is to provide a heat reactor wherein all of the typical pre-existing components, such as the fuel dispensing means, igniters, blowers, etc., can be used with the current heat reactor without the need for any modifications.

Another object of the present invention is to provide a heat reactor that can be used for any type of liquid fuel of choice, such as high-octane aviation fuel, heating oils, kerosene, alcohol, or virtually anything that can be atomized into the chamber and ignited.

Other objects and advantages will be seen when taken into consideration with the following specification and drawings, etc.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is substantially an overview of the existing prior art.

Figure 2 represents a block diagram and plan view depicting the preferred embodiment for the present invention.

Figure 3 is substantially a perspective overview depicting the internal construction for the preferred embodiment for the present invention.

Figure 4 is substantially a perspective overview showing one flow conditioner of the present invention.

## DETAILED DESCRIPTION OF THE DRAWINGS

Referring now in detail to the drawings wherein like characters refer to like elements throughout the various views. The present invention varies from the typical swirl type combustion systems such as those generally known and used in the industrial heating and home heating industry. The present invention more particularly relates to prior art devices such as a ram jet motor or the like such as typically used in the aerospace industry as depicted within figure 1.

The concept as taught therein is substantially the same as the present invention as it also utilizes the same operational components, such as a controller mechanism (not shown) for operating the system including an ignition system (10), a fresh air blower mechanism (12), a fuel supply (14), associated fuel dispenser (16) and fuel igniter (18), etc, each of which are exemplified in figure 2. It is to be understood such components are typical and well known within the field. Thus, their teachings are not provided herein, yet it is to be understood any type of these components maybe incorporated depending on manufacturing and/or engineering choice. It is to be further understood that each of the noted components can be installed at the point of manufacture and/or as a retrofit onto existing equipment at the work site.

The novel and unique qualities of the present invention are achieved because of the shape, size, internal structure and components of the heat reactor housing (20), which in combination provide unusual results theretofore not taught. For example, the preferred embodiment for the present heat reactor system includes an elongated tubular housing (20) (that is made from or coated with a high heat-resistant material) having an inlet duct (22) and an outlet duct (24). Housing (20) is partitioned internally forming at least a first combustion chamber (23) and at least one or multiple reactor compartments (26) that are

separated by multiple flow conditioners (28), respectively. It is to be understood the system can incorporate any number of combustion chambers (23), reactor compartments (26) and/or flow conditioners (28) depending on engineering design choice and the particular application at hand. Thus the system as depicted herein is only exemplary of one possible embodiment and therefore the invention is not to be limited to any particular number of either.

It is believed the noted unusual results are mainly achieved due to the construction of the flow conditioners (28) that are positioned between the multiple compartments (26). Wherein, each of the flow conditioners (28) are substantially in the form of a circular disc (made from a high heat resistant material) which is of a shape and size to be vertically positioned within housing (20) thus forming the noted multiple reactor compartments (26) between each of the flow conditioners (28). It is to be understood each of the flow conditioners (28) can be fixedly attached in place by any suitable attachment means of choice, such as by welding or the like. Also, there are many variations for the actual construction of each of the flow conditioners, therefore the following is only exemplary of one possible configuration thus the invention is not to be limited thereto.

For more descriptive clarification of the flow conditioners, I refer now to figure 4. Wherein each of the flow conditioners (28), are further defined having multiple slits there through which when bent outwardly form vanes (30), respectively, with each of the vanes directing airflow in a controlled angular manner outwardly there from. Each flow conditioner and/or disc (28) includes multiple locating tabs (32) thereon that allow the flow conditioner to be correctly orientated within housing (20) which is most advantageous. As can further be seen within figure 4, flow conditioners (28) when formed do not include any centralized opening which is important as this does not allow the gases to escape there through, rather the gases are substantially restricted which in turn provides increased dwell time. This restriction can be accomplished in a number of ways, such as each flow conditioner and/or disc (28) may include multiple cross bars (34) that function to deflect, condition and block the gases from escaping from the central area, respectively until proper dwell time has been achieved.

It can now be seen due to flow conditioners, the air, gases and pollution when transferred from one compartment to another are forced into a spiraling motion that in turn provides the unusual results. For example, when the polluted air, etc., is forced into the next compartment via the vanes of the flow conditioner, the noted spiraling motion thereof causes the heavier materials i.e. hydrocarbons, carbon and any other heavy molecules of the fuel therein to be directed to the outermost area of the associated compartment because of centrifugal force, respectively, and are retained in the outermost area until converted by combustion to a lighter substance, namely a gaseous form. Thereafter, once converted into a gaseous form it is then light enough to migrate back to the center area of the associated compartment and onto the next compartment via the next flow conditioner. Whereby, due to use of the flow conditioners (28), the system provides highly increased dwell and/or burn time and this is the key or secret to total combustion. This is easily accomplished due to the variable angle of the vanes on the flow conditioners that set the direction and velocity of the swirling gases. This allows the heated gases to be retained inside each of the compartments and elevated to a high temperature for a period of time instead of being immediately exhausted throughout the outlet duct (24). This process is continued throughout each of the compartments (26) until there is nothing left but gases, thus no  $C_xH_x$  fuels, etc. Thereafter the heated gases are expelled from within housing (20) via outlet duct (24) respectively. Thus the now pollution free hot gases and/or air may be used for energy purposes in an environmentally friendly manner, such as for heating or the like.

It will now be seen the Heat Reactor system as taught herein causes hydrocarbon compounds ( $C_xH_x$  Fuel) to be reduced to their base atomic elements by the application of intense steady heat and retaining them inside a confined area under controlled conditions with just the correct amounts of fuel and air. Thus, the heat reactor system of the present invention virtually eliminates all pollution such as hydrocarbons, particulates (such as carbon particles in the form of soot from diesel engines), and offensive fuel odors while being very energy efficient.

It will further be seen that in operation, when the systems controller and other noted components are activated and the correct amount of fuel and air is injected into the combustion chamber (23) via inlet duct (22), a primary turbulence zone such as depicted in figure 3 is established therein and within this zone the mixture will be ignited and combusted. The ignited fuel and air mixture in the center of the turbulence zone produces sufficient heat to cause the incoming fuel to instantaneously combust and start to decompose back into its natural elements, whereby releasing energy in the form of intense heat.

It will also be seen that the amount of time for combustion and decomposition of the polluted material until it transforms into a gaseous state is variable depending on the size of the heat reactor system, the type of pollutant, the amount, the velocity of the gases, etc, all of which can be adjusted for ultimate performance at the point of operation.

It will also be seen I have herein provided a heat reactor system wherein the combustion chamber and the compartments increase the energy efficiency of the system through the orderly mixing of fuel and fresh air making it greater than 99.99 % total combustion with any liquid fuel or gaseous fuel. At the proper operating temperatures, fewer oxides of nitrogen are formed and carbon based compounds are reduced to their base elements. The selection of the most effective temperature for the virtual elimination of fuels is dependent upon the type of fuel selected. The amount of fuel to air ratio will also have an important impact on the efficiency of the heat reactor system and the lack of carbon based pollution and a reduction in NOx.

As previously noted the liquid fuel injector system is the same mechanical device presently used in the industry to convert any liquid fuel to an atomized gaseous fuel prior to being injected into the combustion chamber. However, when the fuel to be used in the combustion chamber is already in a gaseous state, a prior art liquid fuel atomizer system is not needed which is most advantageous. Also, the fuel injector system can be selectable between the liquid and gaseous fuels depending on the fuel of choice.

Also previously noted, the standard controller devices now used in the home and within the heating industry are adaptable to this system. Whereby, any controller that can control the startup sequence by initializing the fuel injection system, the blower, ignition mechanism and the fuel supply to maintain the proper operating temperatures within the heat reactor system may be used.

It will also be seen that all of the current components now used in the home or within the heating industry can be used. No change in the supporting infrastructure is required other than the addition of the heat reactor system.

It will now be seen that overall I have herein provided a heat reactor system that is novel and unique because it can be easily made from one stainless steel tube, no additional maintenance is required, extremely low pollution output, it accomplishes almost total combustion (greater than 99.99 %) of any fuel used, liquid or gaseous, and all components, fuel dispensing, igniters, and blowers, currently used in the home and industrial heating industry can be used with this heat reactor system. Also, any liquid fuel from "high octane" aviation fuel to heating oils, kerosene, alcohol, and virtually anything that can be atomized into the combustion chamber and ignited can be used.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made there from within the scope and spirit of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices and apparatuses.